

使用時間延遲及偏移系集對中央氣象局 全球資料同化系統的影響

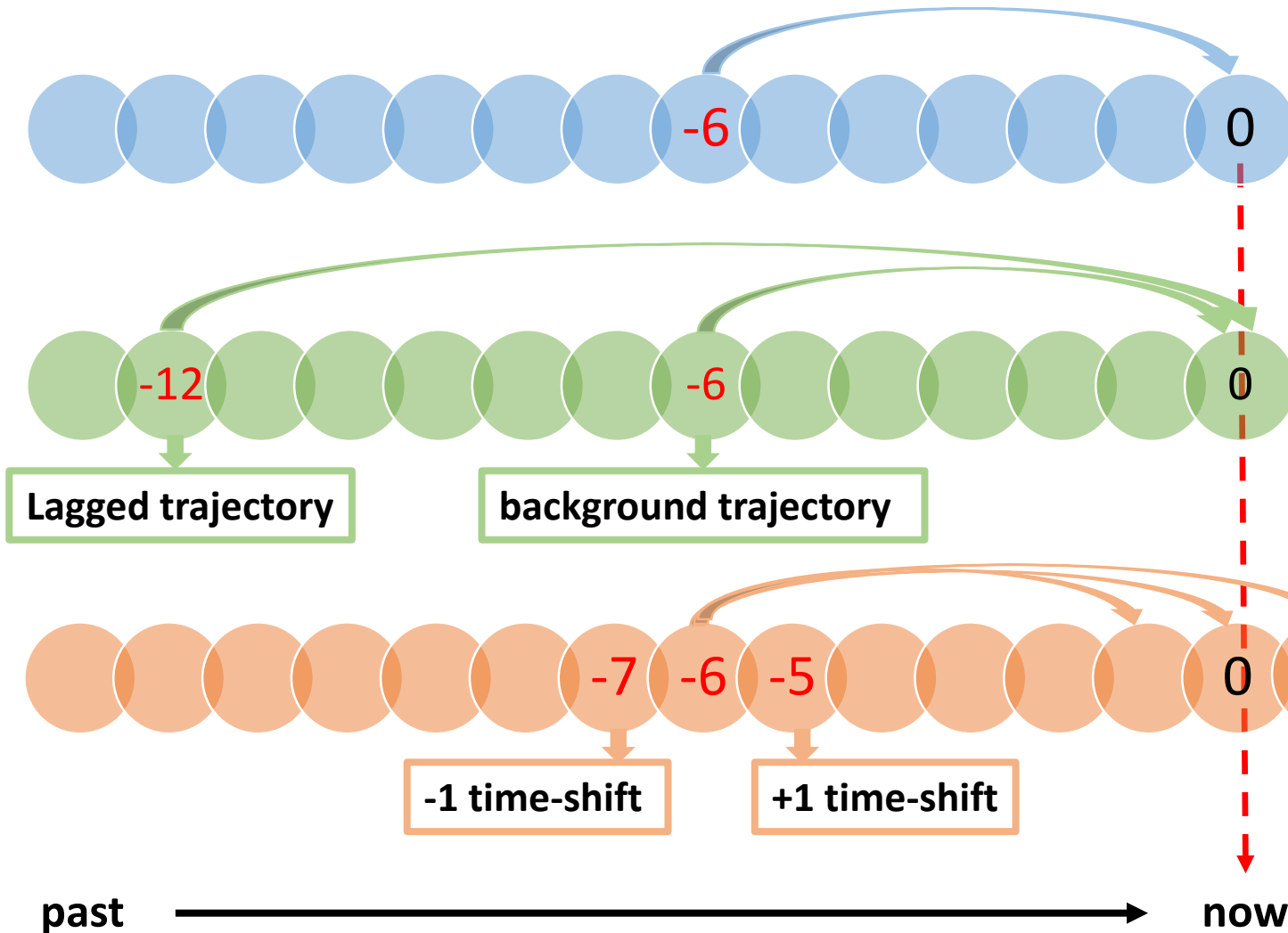
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Time-lagged and time-shifted ensemble

-6 36 EnKF members



Time-lagged uses perturbations valid at the correct time, from longer forecasts from the previous cycle.

Time-shifted uses perturbations valid at slightly different times.

Experiments

Period :

2016010100 ~ 2016012400

(Spin-up time: 2015121500 ~ 3012)

Localization:

Horizontal: 800 km

Vertical: $\ln(p) = 0.8$

Experiment :

ctrl:

Resolution: Main: T511L60 / Members: T319L60

$\beta_s = 25\%$, NMC perturbation ,

36 EnKF members .

LAG :

Resolution: Main: T511L60 / Members: T319L60

$\beta_s = 25\%$, NMC perturbation ,

72 members (36 EnKF members, 36 12-hour-lag members) .

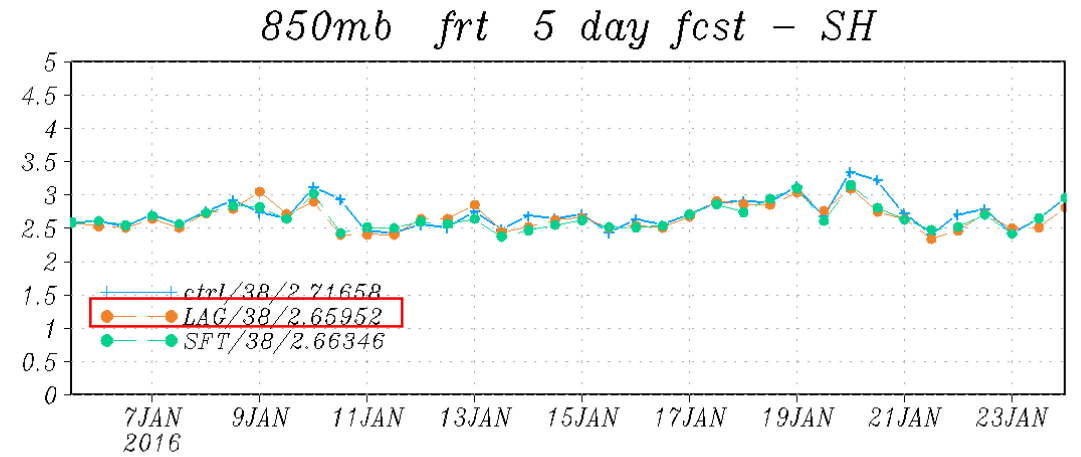
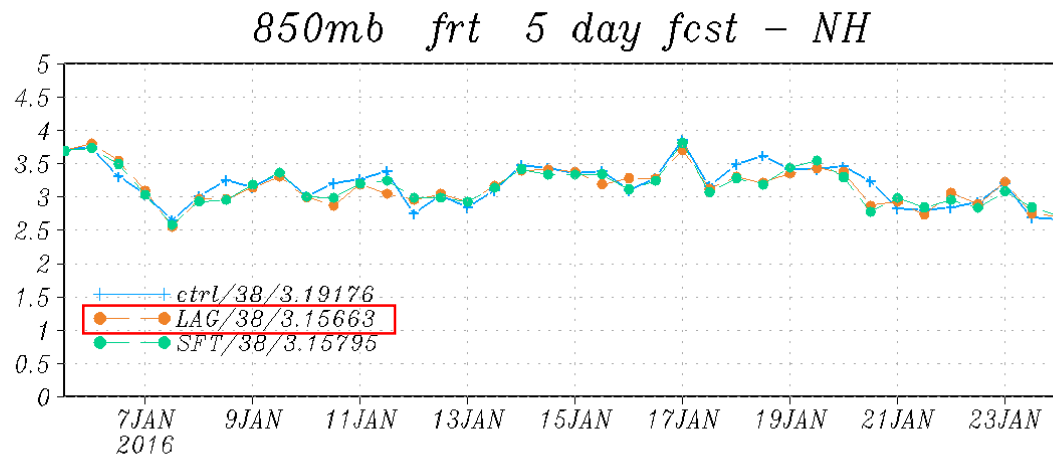
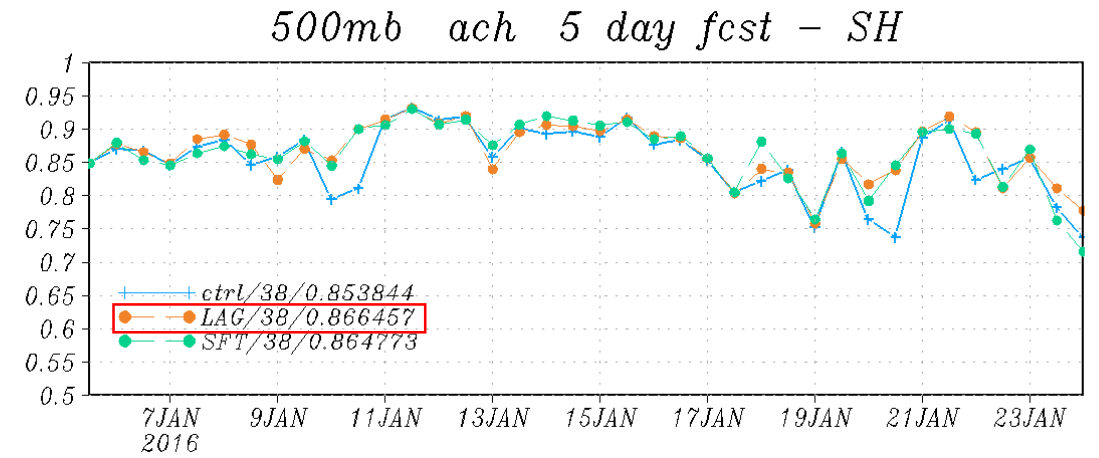
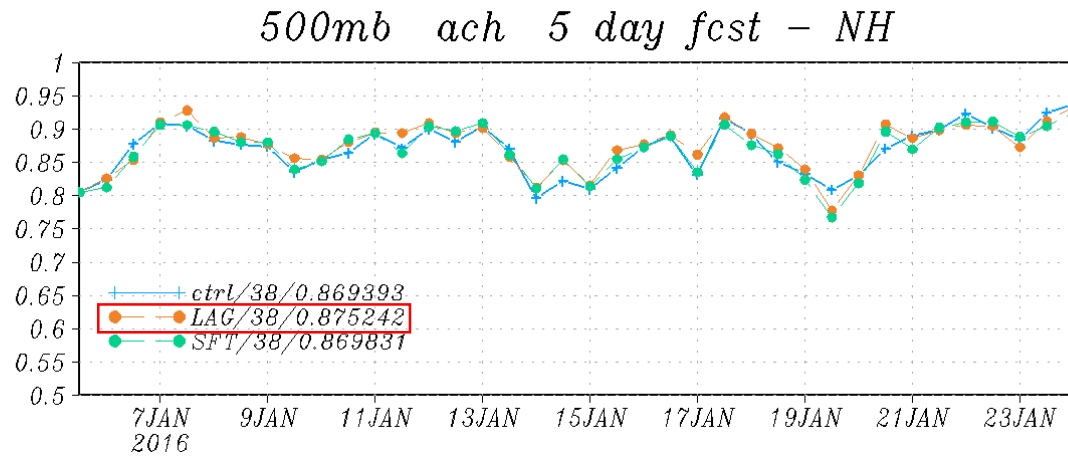
SFT :

Resolution: Main: T511L60 / Members: T319L60

$\beta_s = 25\%$, NMC perturbation ,

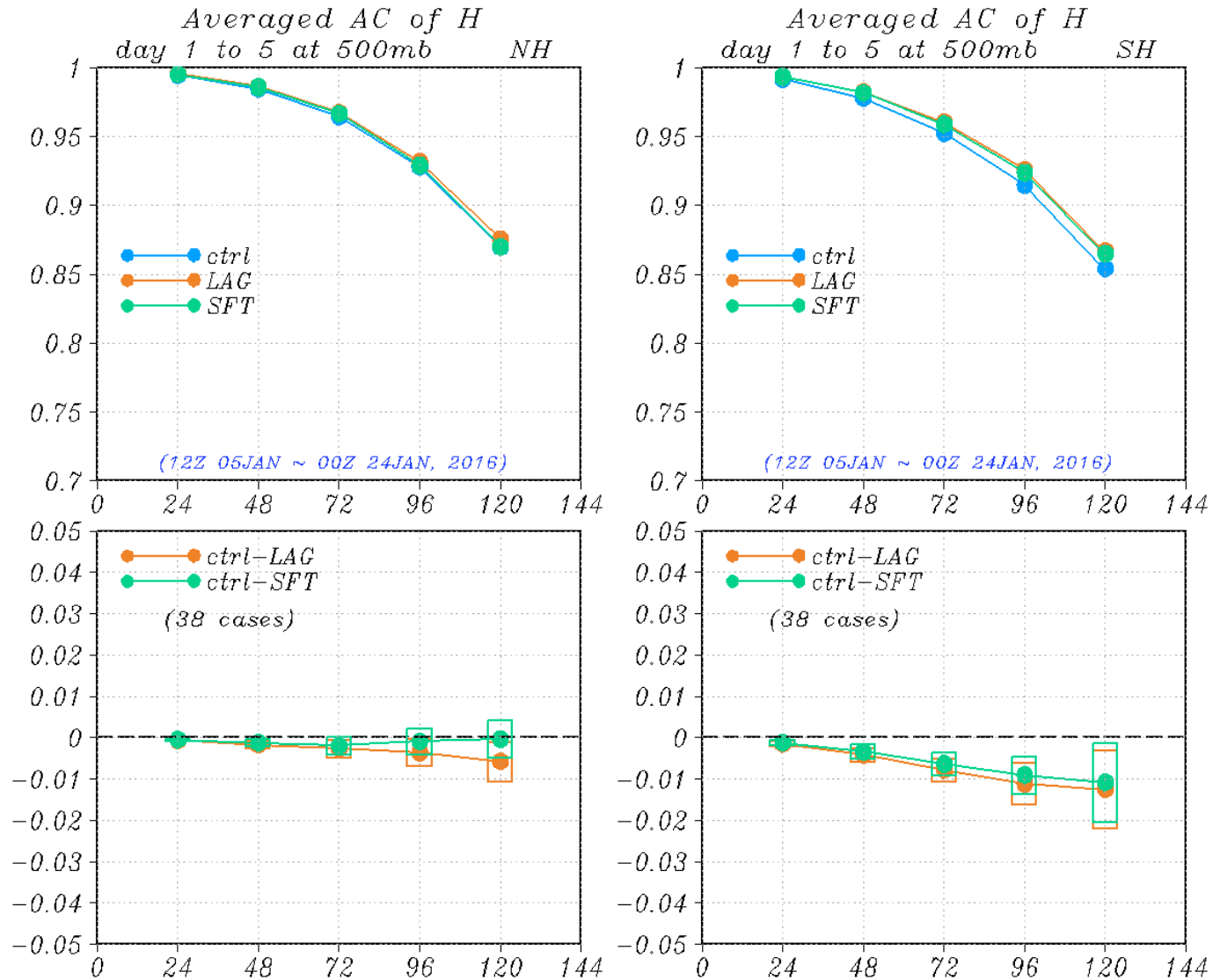
108 members (36 EnKF members, 72 1-hour-shift members) .

5 day forecast against NCEP analysis (2016010412--2016012400) NH, SH time series



Time series of 500-hPa geopotential height anomaly correlation and 850-hPa RMS temperature error scores for 5-day forecasts for the ctrl(blue) 、 LAG(Orange) and SFT(green) experiments verifying in the Northern Hemisphere and Southern Hemisphere.

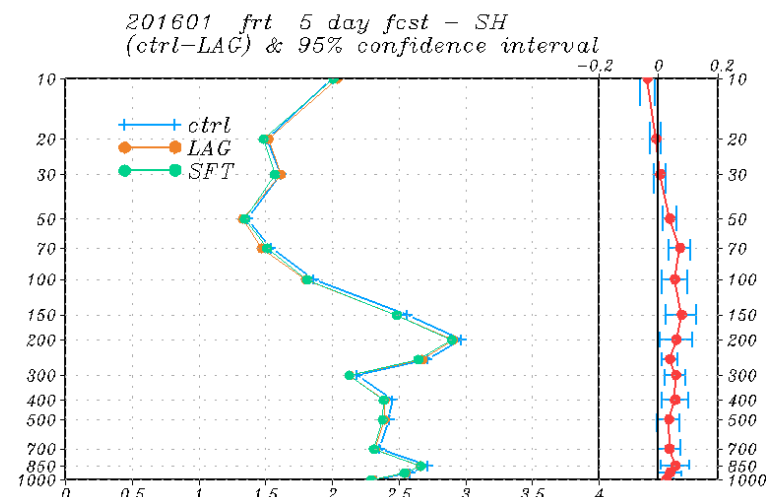
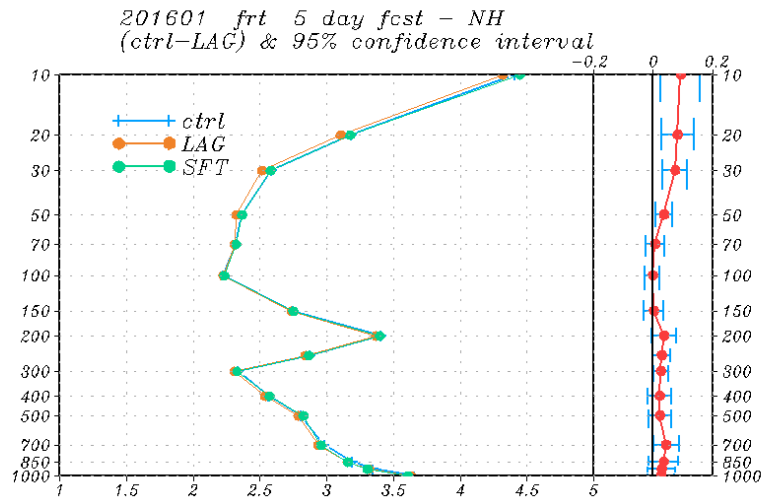
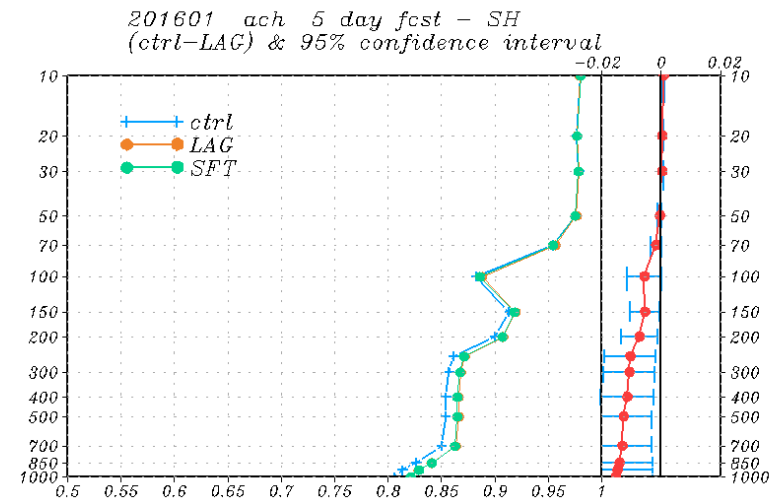
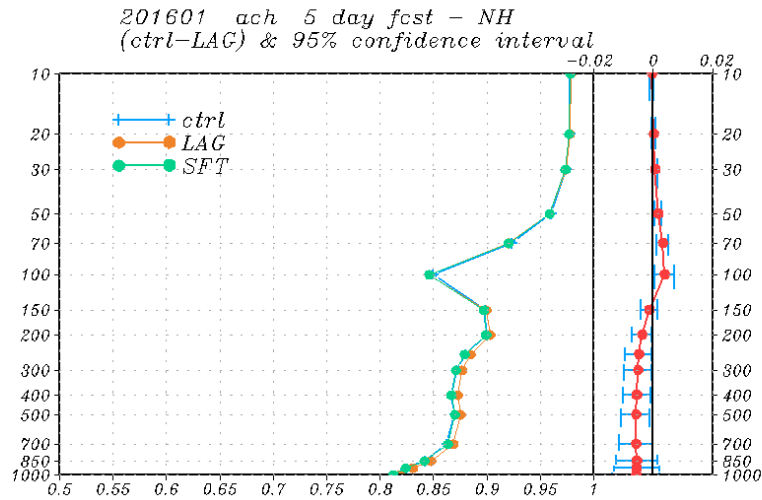
1st to 5th day forecast against NCEP analysis
 (2016010412--2016012400) NH, SH



The average 500-hPa geopotential height anomaly correlation scores by forecast day for ctrl(blue) 、 LAG(Orange) and SFT(green) forecasts (a) Northern and (b) Southern Hemispheres.

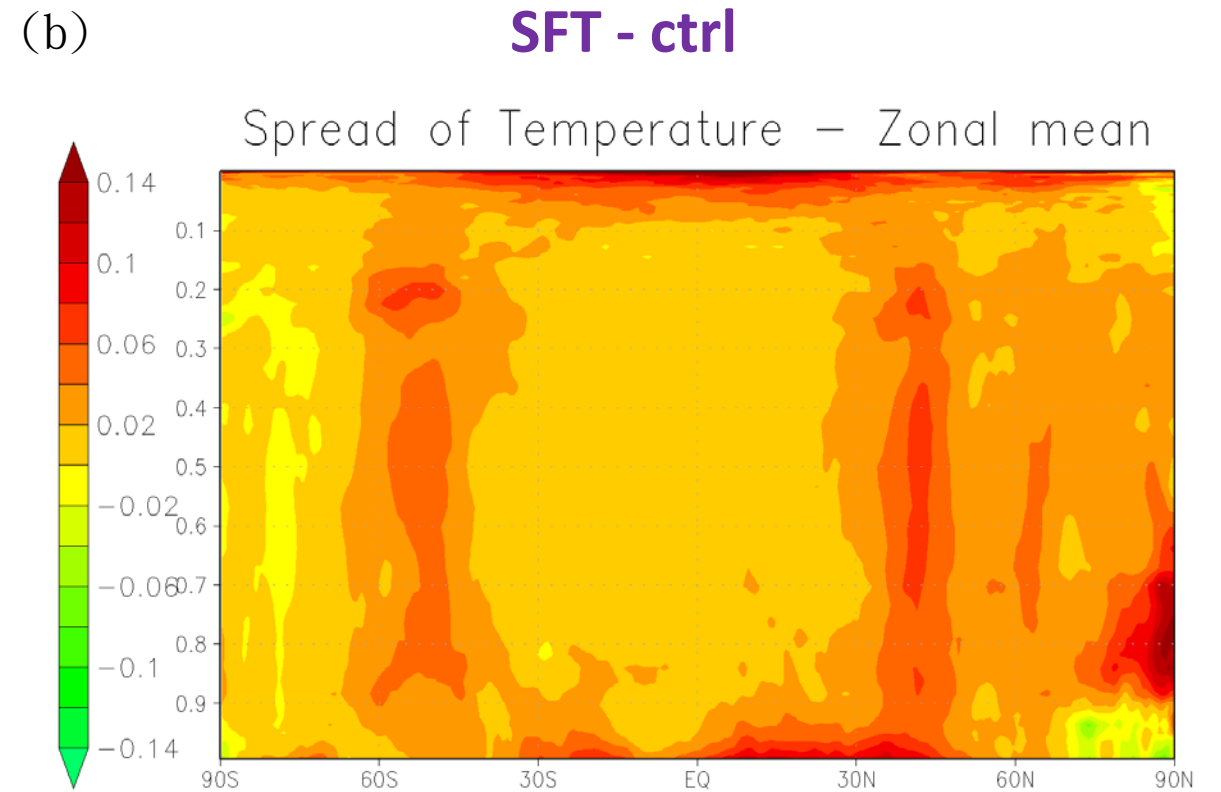
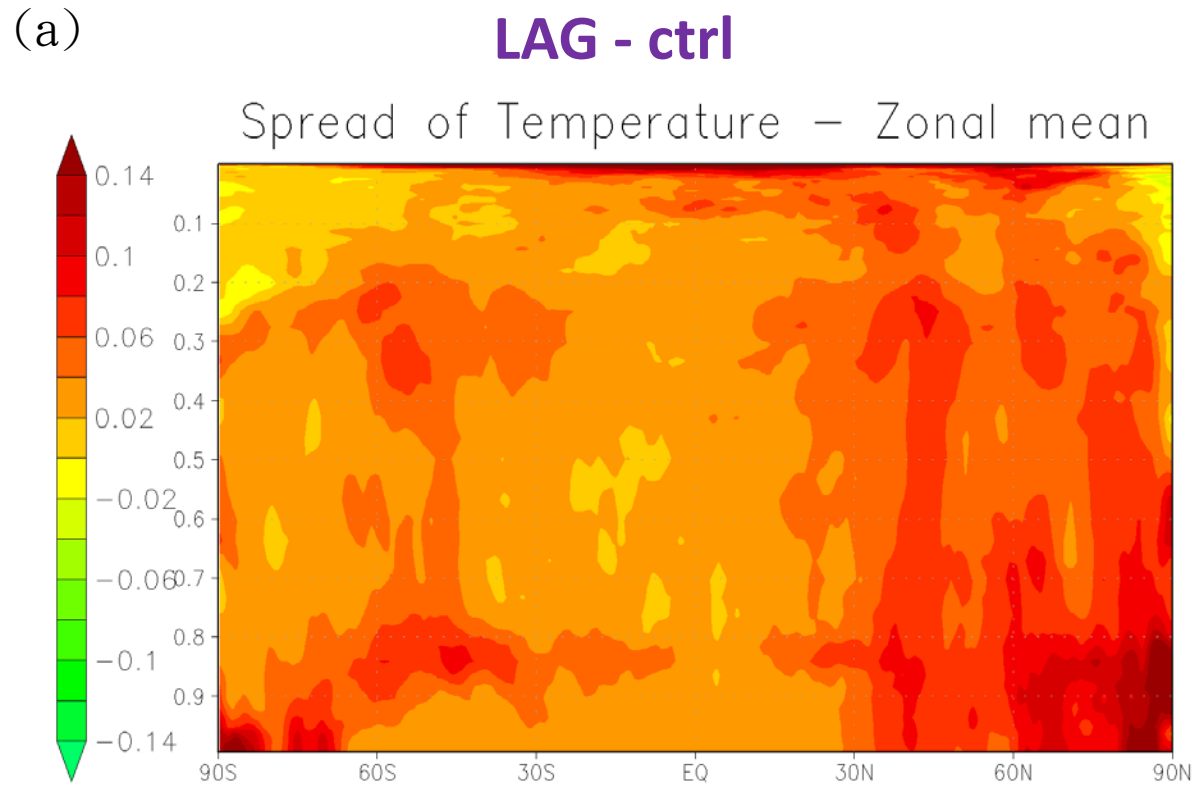
The error bars represent the significance of the difference between the two runs at the 95% confidence level.

5 day forecast against NCEP analysis (2016010412--2016012400) NH, SH vertical



Vertical profiles of geopotential height anomaly correlation and RMS temperature error for the ctrl(blue) 、 LAG(Orange) and SFT(green) experiments verifying in the Northern Hemisphere and Southern Hemisphere.

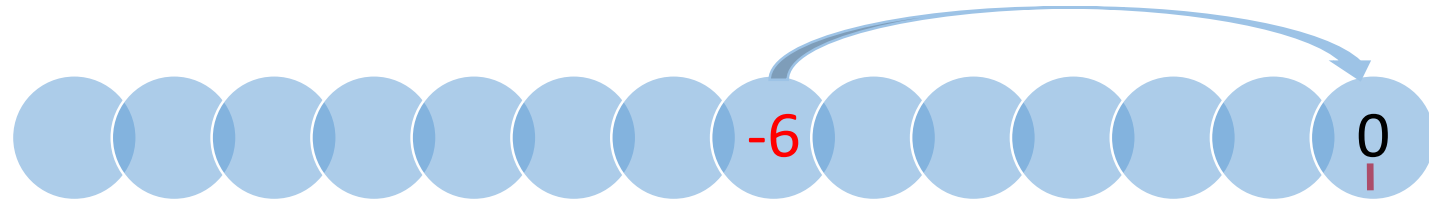
Ensemble spread analysis (2016010100--2016010700)



溫度場散度的緯度平均差異分佈，時間是2016年1月1日00Z至2016年1月7日00Z，
(a)為LAG減去ctrl的緯度平均差異分佈，(b)為SFT減去ctrl的緯度平均差異分佈。

Time-lagged and time-shifted ensemble

-6 36 EnKF members



Experiment :

ctrl:

Resolution: Main: T511L60 / Members: T319L60

$\beta_s = 25\%$, NMC perturbation ,

36 EnKF members .

SFTLAG:

Resolution: Main: T511L60 / Members: T319L60

$\beta_s = 25\%$, NMC perturbation ,

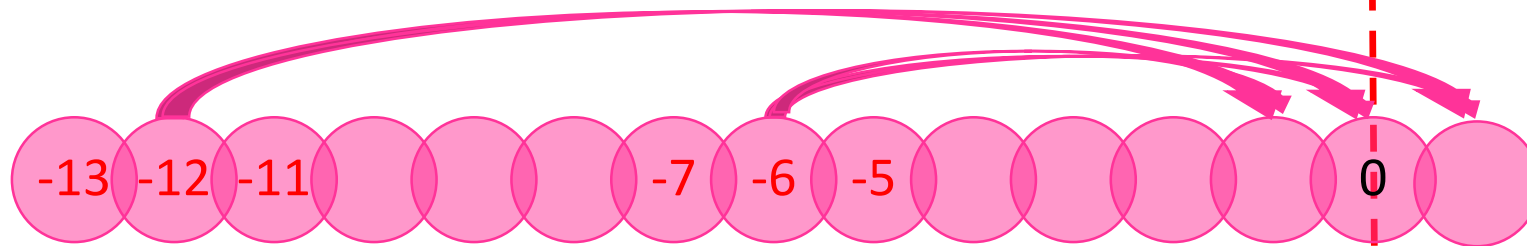
216 members

(36 EnKF members,

36 12-hour-lag members

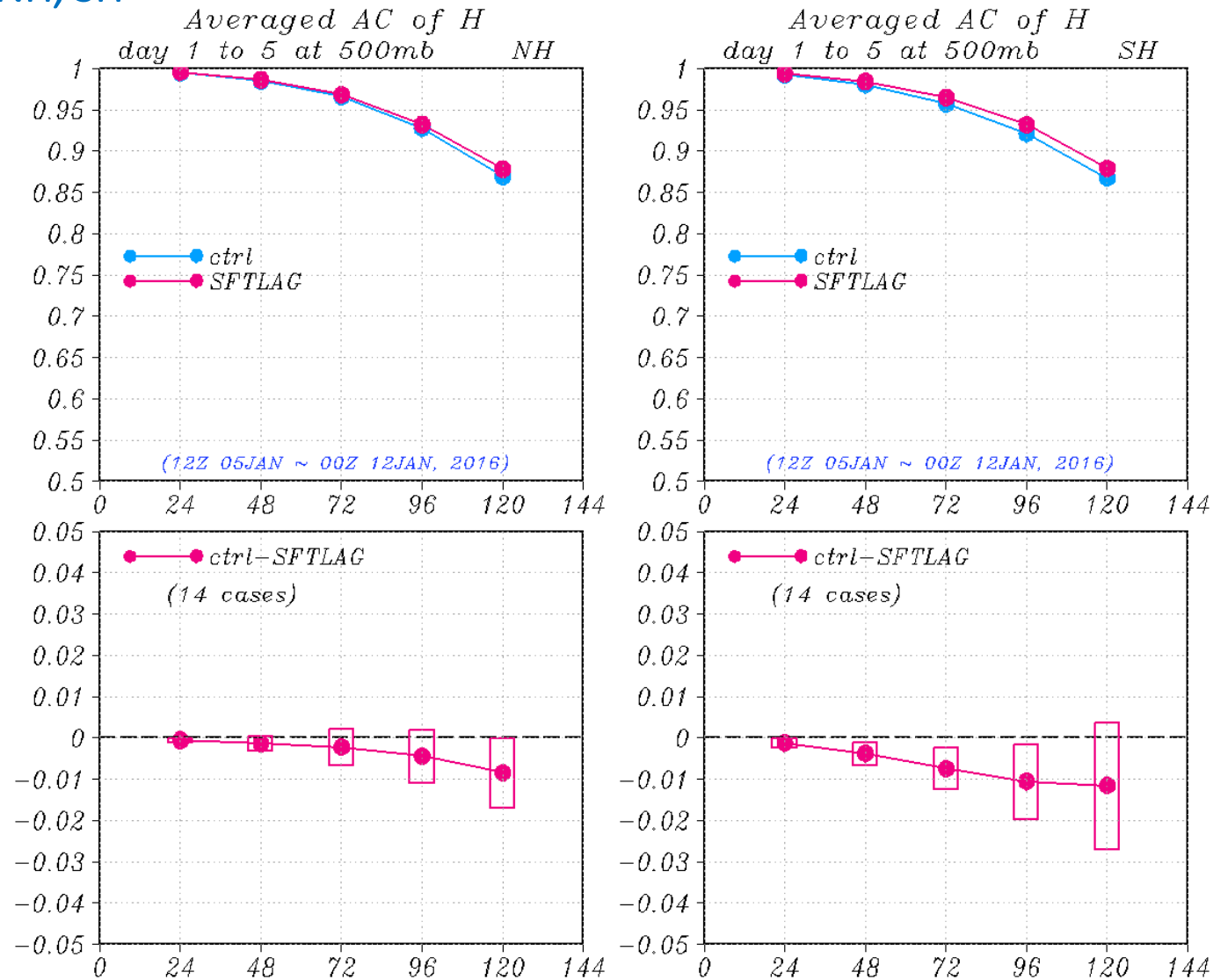
72 1-hour-shift,

72 1-hour-shift of 12-hour-lag members) .



past  now

1st to 5th day forecast against NCEP analysis (2016010412--2016011212) NH, SH



The average 500-hPa geopotential height anomaly correlation scores by forecast day for ctrl(blue) and SFTLAG(red) forecasts (a) Northern and (b) Southern Hemispheres.

The error bars represent the significance of the difference between the two runs at the 95% confidence level.

Results summary

- 使用時間延遲及偏移兩種方法，確實能夠改善現階段36個成員架構下的資料同化系統的預報表現。
- 這三組實驗的差別是系集組員來源與大小的不同，也顯示除了系集成員的品質會影響預報結果的表現，而系集成員數量也是影響預報表現的重要原因之一。
- 使用時間延遲與偏移兩種方法增加系集成員，代表著我們就算僅使用較少(有限)的資源下，可以提供更好的模式背景誤差估計，以發揮混成資料同化本身的優勢，改善現階段全球預報模式的資料同化系統。

Thank you for your attention